इंटरनेट मानक

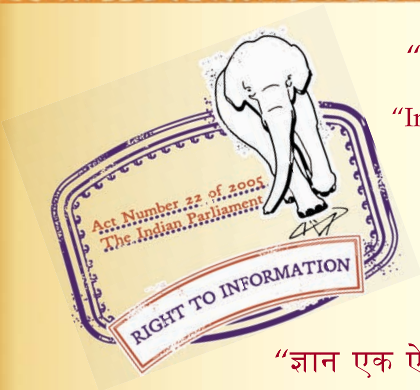
Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”
Mazdoor Kisan Shakti Sangathan
“The Right to Information, The Right to Live”

“पुराने को छोड नये के तरफ”
Jawaharlal Nehru
“Step Out From the Old to the New”

IS 11448 (2000): Application Guide for ac Electricity Meters [ETD 13: Equipment for Electrical Energy Measurement and Load Control]



“ज्ञान से एक नये भारत का निर्माण”
Satyanarayan Gangaram Pitroda
“Invent a New India Using Knowledge”

“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”
Bhartṛhari—Nītiśatakam
“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE

BRUTUM FULMEN

IGNORANTIA JURIS NON EXCUSAT

PROTECTED BY COPYRIGHT

IS 11448 : 2000

भारतीय मानक

ए सी विद्युत मीटरों के लिए अनुप्रयोग मार्गदर्शिका

(पहला पुनरीक्षण)

Indian Standard

APPLICATION GUIDE FOR ac ELECTRICITY METERS

(*First Revision*)

ICS 17.220.20

© BIS 2000

BUREAU OF INDIAN STANDARDS

MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG

NEW DELHI 110002

July 2000

Price Group 4

Equipment for Electrical Measurement and Load Control Sectional Committee, ET 13

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Equipment for Electrical Measurement and Load Control Sectional Committee had been approved by the Electrotechnical Division Council.

This Standard was originally issued in 1985 and in the first revision the requirements for Static Energy Meters have been added.

Selection of electricity meters and instrument transformers of appropriate accuracy classes is of very vital importance to ensure accurate measurement of energy commensurate to the level of energy consumption, distribution, transfer and exchange.

This guide has been prepared with the specific purpose of describing the various metering arrangements that are possible and also to suggest the selection of meters for different category of electricity tariffs.

The introduction of static meters for measurement of electricity has changed the utility practices in installation and reading of meters for billing the consumers. By using static meters, apart from billing, various other applications are possible. This revised guide also covers the application of static electricity meters in measurement and control of electricity supply.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, comprising the result of a test, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard
APPLICATION GUIDE FOR ac ELECTRICITY METERS
(First, Revision)

1 SCOPE

This guide gives information on different types of electricity meters and their application in measurement, recording and control of electricity supply.

2 REFERENCES

The Indian Standards given in Annex A are necessary adjunct to this standard.

3 TERMINOLOGY

In addition to the definitions given in various standards listed in Annex A, the following definitions shall apply.

3.1 Concurrent Demand

The sum total of the energy values obtained in all the feeders in a multi-feeder supply system feeding into a load system and divided by the demand integration period over which these energy values are summated in real time.

3.2 Concurrent **Maximum Demand**

The maximum of the concurrent demand values obtained in consecutive demand integration periods over a specified period of time.

3.3 **Multi-Energy Meter**

Meter which, in a single case, measures two or three type of electrical energies (watt-hour, Var-hour, VA-hour).

3.4 **Multi-Function Meter**

Basic or multi-energy meter which. in a single case, has functions that are not described in basic standards for energy meters.

NOTE — Multi-function meter may include maximum demand indicator, time switch. radio transmitter/receiver. pulse output device, etc.

3.5 **Actual Metering Point**

The physical location at which the electricity is metered.

3.6 **Defined Metering Point**

The physical location at which the accuracy requirements are to be met.

4 ELECTRICITY TARIFF

4.1 Unit Tariff

A single parameter unit tariff is generally imposed on low and medium voltage consumers primarily to recover the running energy dependent cost ofelectricity. It is sometimes accompanied with a time based or load based or frequency based differential pricing or a combination of these to justify the economics of supply and demand.

4.2 **Two Part Tariff**

It combines unit tariff and maximum demand tariff with or without reactive energy based surcharge for low power factor, and with or without time based differential pricing of unit and/or maximum demand for preferential time of use. It is generally applied for consumers supplied at medium and high voltages. It is made up of two parts, one to pay for the fixed power dependent cost and other for running energy dependent cost. The metering consists of kWh and kVArh and/or kVAh meters/metering elements in a single case, having the required accuracy with an arrangement to measure the maximum demand. The integrating period of maximum demand indicator is controlled by an internal time clock or by an external time switch.

4.3 **Time of Day (TOD) / Time of** Use (TOU) Tariff

In this type of time based unit or two part tariff for differential pricing of energy and/or maximum demand, the entire hours of one day or of seven days of one week or 365 days of one year are grouped in specific time slots, each slot being associated with specific metering register(s). Different Time of Use (TOU) tariff for energy and/or maximum demand are then applied to various meter values obtained from these registers, with the objective of encouraging consumption in the lean demand hours of day/week/year and discouraging the same in the peak demand hours of the day/week/year in order to even out the profile of energy consumption curve. When the preferential "Time of Use" tariff (TOU) is limited only to 24 h of the day, it is called the "Time of day" tariff (TOD).

4.4 **Reactive Energy Based Two Part Tariff**

Where two part tariff is based on kWh and kW maximum demand, the surcharge for low power factor is some times levied when the average power factor for the entire billing period is determined from kWh and kVArh (lag only) advances and the same is below a threshold value.

4.5 Bulk Supply Tariff

4.5.1 The term "bulk supply" implies transfer or exchange of considerable amount of power at the sending/ receiving ends of an inter-connected extra high voltage network. The tariff imposed is basically a two part time of day tariff with various combinations of differential unit pricing and maximum demand pricing. For optimum evaluation and control of cost and demand, more detailed information is generally required than in the case of two part tariff. Sometimes, frequency based differential pricing is applied for drawal of energy in different frequency blocks, in order to make a balance between supply and demand. On the other hand, voltage based differential pricing for reactive energy values is effected to endeavour correction of voltage profile. The metering generally consists of a combination of the following instruments:

a) kWh meter with maximum demand indicator/ register — Import/Export.

b) kVArh meter with maximum demand indicator/ register-Import/Export, Inductive/Capacitive.

c) kVAh meter for full power factor range with maximum demand indicator/register- Import/ Export.

d) Multi-feeder summator with concurrent Maximum Demand -by mechanical/electrical/ electronic devices.

e) Average demand recorder — Printometer/Demand Profile Monitor.

f) Meter having external or internal frequency measuring devices to register energy values in different frequency blocks.

g) Meter having voltage dependent device to activate reactive unit registers for over voltage and under voltage blocks.

4.5.1 The metering may consist of single static meter having capability for multi-energy measurement and registration and also to perform the multi-functional aspects of above instruments.

5 METERING ARRANGEMENT FOR VARIOUS TARIFF

5.1 Watt-Hour Meter

5.1.1 *Recommendations of Accuracy Class for Different Consumers*

5.1.1.1 *Class 2.0 accuracy*

Watt-hour meters of class 2.0 accuracy are generally recommended for registration of energy supplied to consumers on low and medium voltages.

5.1.1.2 *Class 1.0 accuracy*

These meters are generally recommeneded for registration of energy supplied to consumers at high voltages. Low and medium voltages consumers having large off-take may also be metered by meters of this accuracy class.

5.1.1.3 *Class 0.5 accuracy*

These meters are generally recommended for registration of energy supplied to consumers at extra high voltages. Consumers supplied at high voltages but having considerable offtake may also be metered by meters of this accuracy class.

5.1.1.4 *Class 0.2 accuracy*

These meters are generally recommended for registration of energy in bulk supply, that is transfer or exchange of considerable amount of power at sending/receiving ends of an interconnected extra high voltage network. Consumers supplied at extra high voltages but having considerable off-take may also be metered by meters of this accuracy class.

NOTE — If energy drawal is low (not zero) for appreciable period of time, meters of special measuring range designated by 'S' after the class index, namely class 0.2S and class 0.5S, are recommended in place of class 0.2 and 0.5 respectively. Static meters of class 0.2S and 0.5S conforming to IS 14697 are available.

5.1.2 *Long Range Meters*

Long range meters with continuous current carrying capacity of 400 percent of basic current or more for single-phase meters and 200 percent of basic current or more for 3 phase meters are recommended for use:

a) On circuits where wide variations in the load are involved,

b) On circuits where growth of demand is envisaged in near future, and

c) To effect standardization of meters manufactured or handled by a supply utility.

5.1.3 *Instrument Transformer Error Compensation*

In a microprocessor-based static meter, it is possible to compensate for error profiles of external instrument transformers (CTs and VTs). In such a compensated metering system, high overall metering accuracy can be obtained as per any statutory requirement, contractual agreement or recommendation given in a code of practice.

For effective error compensation, actual connected burdens of current and potential transformer circuits need determination either by measurement or by

estimation. The CT and VT ratio and phase errors for such values of working burdens are required to be found out.

5.1.4 *Compensation for Transformer and Line Losses*

Where the Actual Metering Point and Defined Metering Point do not coincide, compensation for power transformer and/or line losses are provided, if necessary, to meet the overall accuracy requirements at the Defined Metering Point.

5.1.4.1 Sometimes electro-mechanical meters are designed to read V^2-**hour** and I^2-**hour** to **register** transformer loss and/or line loss respectively, the proportional constants having been determined from data available for the transformer and line conductors. The loss can be computed with meter values at Actual Metering Point so that the requirements at the Defined Metering Point are met.

5.1.4.2 In a singlemicroprocessor based static meter, it is possible to incorporate similar compensation for transformer and/or line losses based on V^2-**hour** and I^2-**hour** measurements, the proportional constants having been fed into the memory, so that the meter values at Defined Metering Point are obtained.

5.2 **Maximum Demand and Power Factor**

5.2.1 *Maximum Demand*

It is calculated using the following two methods.

5.2.1.1 *Block average demand* — In this method, demand calculations are computed successively over discrete demand integration periods in a specified period of time.

5.2.1.2 *Sliding window demand* — In this method, demand calculations are computed over demand integration period which progressively moves or slides in a specified period of time. There is continuous overlapping between the previous and the current integration periods.

5.2.2 *Kilowatt* ***Maximum Demand*** *Meter*

5.2.2.1 These meters register energy consumption as well as kilowatt maximum demand which is based on energy consumption in successive interval (sliding/block) of a prescribed time, which is normally 30 min, but may be **5,15 or 60 min** as well.

5.2.2.2 The meters are used for a tariff, which is linked to kilowatt maximum demand, in place of precision **kVA** maximum demand metering, if not available or justified in the-concerned system.

5.2.3 *Kilovolt Ampere Maximum Demand Meter*

5.2.3.1 To discourage.consumption of energy at low power factor, It is necessary to consider the application of meters or combination of meters which take into account the **kVA** demand and reactive energy consumption. Tariffs based on maximum demand in **kVA** have an ever-increasing importance in our country where inductive loads take a very high share of the total power supplied. The apparent energy may be measured by rather complex instruments and methods. On the contrary, simple methods having a strictly restricted range of power factor areavailable. These **meters** are covered by IS 14415. Outside the designated power factor ranges, the errors are sometimes so high as to become totally unacceptable.

5.2.3.2 **It** is however recommended that for ail systems above 3.3 **kV,** the tariff be based on **kWh** and maximum demand in **kVA,** provided the available metering equipment registers **kVA** with commensurate accuracy at **all power** factors from unity to zero lagging/leading.

The desired metering technique utilises an apparent energy computer actuated by one **kWh** meter and one **kVArh** meter to achieve the vector sum definition of the total equivalent **kVAh of the** polyphase circuit. Alternatively, it employs a linear converter consisting of a rectifier and a solid state **inverter** or a transductor to achieve the arithmetic-sum definition of the total equivalent **kVAh** of the polyphase circuit. Due to ambiguity of **3-phase kVA,** the tariff must specify the adopted definition of the **3-phase kVA maximum** demand.

5.2.4 *Kilowatt Maximum Demand Meter with Reactive Kilovolt Ampere-Hour Meter*

A combination of 3 phase watt-hour meter with Maximum Demand indicatorand a reactive volt ampere hour meter may be installed together for computation of average power factor during the billing period from the active energy units and the reactive-energy units when the tariff is linked to kilowatt maximum demand as well as a surcharge is levied for deterioration of power factor. The Var hour meters are generally provided with reverse running stops to prevent reverse registration during the period when the power factor of the consumer is leading.

However, with static meters, computation of average power factor may be carried out using reactive energy values, either lag only or lag and lead.

5.2.5 *Cumulative Maximum Demand Register*

For checking purpose, it is often necessary to know the maximum demand reading for the previous assessment period. An additional register may therefore be provided with a gear train coupled to the maximum demand pointer spindle. When the maximum demand pointer is reset at the end of the demand assessment period, the maximum demand reading is automatically

transferred to the cumulative register which thus shows the sum of all the maximum demands to date. The reading for the last period can be determined merely by deducting the previous reading from the existing one.

In case of static meters, a cumulative maximum demand register is provided for this purpose, so that on each reset, maximum demand of the current period is added to cumulative maximum demand register.

5.2.6 *Maximum Demand Meter with Repetition Counter*

Some tariffs are based on the number of times near peak average demand are registered in a billing period instead of one single maximum demand registration. For this purpose, a special type of MD meter may be installed containing a counter that registers the number of times average demand exceeds a near peak threshold value.

With static meters, demand recording facility may be installed for this purpose. The readings registered in the meter memorymay be analyzed to find the number of times the average demand exceeded at near peak threshold level.

5.2.7 *MD Reset Count*

An electromechanical or a static meter may be provided with a register to record every time the maximum demand is reset. A static meter may also record the date and time of reset for easy identification.

5.2.8 *VAr Maximum Meter*

When tariff provides for penalties for low power factor at the time of peak demand in kW, kVA, generally average power factor based on the maximum demand readings of reactive power meter and a kWh meter are taken into consideration. This method would be correct only if the maximum demand indications of kW and kVA occur during the same integration period which usually does not happen all the time. VAr Max meter is designed to measure not the maximum but the average reactive power demand arising in the same demand integration period as kW or kVA maximumdemand.

5.2.9 *Integrated Multi-Energy Meter*

In modern integrated multi-energy meters having combinations of active, reactive and apparent energy and demand registers, the apparent energy/demand computation can be done based on the reactive energy (lagging only or lagging + leading). The power factor in such cases is computed based on reactive lagging only or lagging + leading. Power factor can also be computed as the ratio of active to apparent energy values.

5.3 **Bulk Supply Meters and Recorders**

5.3.1 *Import and Export Registration*

5.3.1.1 When there is an exchange of energy between two systems. It is necessary to have a metering arrangement whereby the import and export data are available separately. The information is generally registered by different sets of meters or a single set of meters having different sets of registers, with reverse running stop.

5.3.1.2 *Four quadrant meters* — In an interconnected system, it is important to determine at various measuring points amount of energy supplied or consumed. Moreover, it is important to note whether such energy is active or reactive and in the later case whether it is inductive or capacitive. The same applies to apparent energy. If the vectorial circle is divided into four quadrants, the following measurements can be obtained:

a) Active energy — Import or export,

b) Reactive energy-Inductive and simultaneously

   i) Active energy-Export, and
   ii) Active energy -Import.

c) Reactive energy -Capacitive and simultaneously

   i) Active energy -Export, and
   ii) Active energy — Import.

d) Apparent energy also measured **in the same conditions** as for reactive energy.

The instrument consists of a full power factor range kVAh meter fitted with special counters and of two reverse power relays, one for active and other for reactive energy. By means-of this instrument, all the above measurements can be obtained with a minimum number of meters. The apparatus consists of a'watt hour meter and a reactive energy meter. The kWh meter is fitted with a pair of counters. One of these registers the import active energy and the other the export active energy. The reactive energy meter is controlled similarly, but it is fitted with four counters grouped in pairs. The speeds of the two meters are constantly added vectorially by means of a set of differential gear wheels and the resultant speed is transferred to the apparent energy counter. This is also provided with four counters grouped in pairs.

A static meter may beprovided.with various registers as required for four quadrant metering.

5.3.2 *Summation Metering*

When energy is transferred or exchanged at a number of points, the unit consumption and average demand data are generally summated by employing impulse

counters based on mechanical/electrical/electronic devices. The output from these meters are then fed into average demand recorders.

In case of static meters, the unit consumption and average demand data are alternatively summated by employing direct digital transfer of meter values by serial communication between various metering points and the Summator unit. It collects unit values from the individual meters, computes the concurrent average demand and registers the concurrent maximum demand.

5.3.2.1 *Average demand recorders*

The conventional average demand recorders and maximum demand meters give only maximum demand during the billing period. However, at bulk supply points, it is essential to know the load curve in detail. The instruments called printometer and maxigraph record the load curve. These instruments are operated from kWh/kVAh meters and provide data of the average demand during every demand integration period, normally 15/30 min. In printometers, the data is provided in the form of printed numerical digits, whereas in maxigraph, this is provided in the form of "Bars", both on strip charts rotating at constant speeds. In printo maxigraph both forms of data, that is, numerical prints as well as bar graphs are recorded side by side. These instruments can also be executed as code printers to be used with computerised systems for load analysis.

5.3.2.2 Modem multi-function, muti-energy static meters are capable ofrecording kW/kVA/kVAr lag/kVAr lead, load profiles for 35 days or more for 15/30 min demand integration period.

5.4 Multi-Rate and Differential Metering

5.4.1 *Time Based Multi-Rate (TOD) Meter*

5.4.1.1 The kWh meter is provided with 2 or 3 energy registers,' one for the peak hour period, one for the day period and one for the night period. The changeover from one register-to the other is done by an internal or external time switch. In the event of non-availability of the above type, two or three separate meters may be used with time switches, one registering energy during the peak hours, the other during day hours and the third during the night hours.

5.4.1.2 In the event of multirate tariff metering being applied for two-part tariff, the corresponding maximum demand readings would also be required for the specified periods. It is then necessary to provide two or three kilowatt maximum demand meters or kVA maximum demand meters which compute kVA as described under 4.2.2.

5.4.1.3 In case of static meters, the kWh/kVArh/kVAh meters are provided with up to eight numbers of TOD registers for different time zones. The changeover from one register to another is maintained by an internal real time clock. These are also capable of recording up to eight numbers of kW/kVA TOD demand in different registers.

5.4.2 *Load Based Differential Meter*

This meter is also known'as excess consumption meter. It registers the total consumption as well as energy consumed at loads higher than a stipulated limit. The meter is used where the tariff provides for charging at a higher rate at loads above the stipulated limit. It is equipped with two separate counters, one giving the total energy consumption and other giving the energy Consumption wheneverthe load is above the specified maximum demand. The second register is actuated whenever the speed of the rotor exceeds the reference speed, which depends on the specified maximum demand as sensed by an arrangement of differential gearing.

Load based differential tariff can also be implemented using static meters.

5.5 Frequency Based Tariff Metering

This type oftariffmay be implemented for grid discipline in inter-utility power transfers. The tariff structure discourages drawal of active energy at a rate in excess of contractual. demand when the grid frequency is low, that is during "deficit" period and encourages the same when the grid frequency is high, that is during "surplus" period, thereby helping to maintain a stable supply frequency of the grid. For implementing this tariff, a meter is required to record the following:

a) kWh units for each successive'fixed time block,

b) Average supply frequency for the same time block, and

c) kWh units computed for each successive frequency block.

5.6 Voltage Based Reactive Meterigg

This type of tariff may be implemented for grid discipline in inter-utility power transfers. The tariff structure discourages drawal of reactive energy when the grid voltage is below a threshold value and encourages the same when the grid voltage is above a threshold value. For implementing this tariff, the reactive energy registers are activated to register on the over-voltage and under-voltage blocks. A normal voltage zone between the two threshold limits is also provided for, where reactive energy is not considered.

5.7 Selection of Instrument Transformers

The current transformers conforming to IS 2705 (Part 2) used for metering of a particular category of tariff are recommended to have accuracy class, generally

one index better than that of the meter. The voltage transformer conforming to IS 3 156 (Part 2) and used for metering for a particular category of tariff, are required to have accuracy class similar to that of the meter. The following may be taken as the guideline:

Meter accuracy class	*2.0*	1.0	0.5	0.5S	0.2S
CT accuracy class	*1.0*	*0.5*	*02*	*02s*	0.2S or 0.1
VT accuracy class	-	1.0	0.5	*0.5*	*0.2*

It is important to note that measuring range of current transformer used should preferably be compatible to the measuring range of meter. Also, the connected burden of each current/voltage circuit should preferably be within the operating range of instrument transformer, that is between 25 percent and 100 percent of the rated output of each CT/VT.

6 MISCELLANEOUS APPLICATIONS

Meters herein before specified are used for accounting purpose as required by various electricity tariffs. These are revenue meters. Besides, other fields of application are as follows.

6.1 Supervision and Control of Average Demand

6.1.1 For effective use of the maximum demand tariff and to cope with any statutory restriction on maximum demand when electricity is scarce, industrial consumers and bulk importers employ maximum demand metering/ average demand recorders with monitoring equipment that indicates continuously on the spot average demand and corrective load with the objective of manual/ automatic control of load/operations so that the average demand may be-restricted closely within the desired limit of maximum demand. These demand controllers are provided with potential free output contacts so as to provide alarm/tripping of certain loads when demand exceeds pre-specified limit.

6.1.2 A complete supervisory equipment is one that incorporates :

a) Measuring units operated from meters with. impulsing output and impulse rate comparators;

b) Controllers with various relaying contacts for alarm, sequential tripping and controlled operatiqn of various processes;

c) Average demand recorders; and

d) Continuous display of on the spot demand, elapsed time of the integration period, corrective load, etc. These are provided with additional incorporation of transducers and electronic circuits.

6.2 Meter for Energy Audit Purpose

Statistical data for system evaluation and planning is often a by-product of revenue metering. But some times additional meters are also installed. These are precision meters of accuracy class 0.5 employed for various statistical purposes, for example, determination of losses and efficiency of electrical transmission system. Apart from the stringent accuracy limits, specified performance at power factor outside the normal limits of unity and 0.5 lag are also required in these meters (For example 0.25 lag and 0.5 lead).

These meters have capability of recording kW/kVA/ kVAr load 'profiles for several days with integration period of 15/30 min. This data can be transferred to a computer directly or by using a meter reading instrument through a communication port provided on the meters. This data can be analyzed by using a suitable software programme.

6.3 Meters for Testing Purposes

Standard meters used for testing of other meters and electrical plants belong to the precision accuracy class of 0.5 or even better up to class 0.05, the meter should have minimum tolerance in error during repetitive measurements and suitable for a restricted variation of test current as compared to revenue meters.

6.4 Measurement of Single Phase Power Supplied for Railway Traction

Track side substations (TSS) of railways are fed over two single phase feeders with automatic PT changeover in the event of failure of supply in one phase. The load condition is either one, or both may be feeding to the TSS. Hence the meter must perform the summation metering to arrive at the concurrent maximum demand.

The modern static meters can be used for traction metering even without the need of PT changeover relay.

6.5 Installation Checks and Site Diagnostics

A static energy meter is sometimes provided with additional facility to validate the electrical service wired up to the meter. It determines the service type, its phase rotation, the phasor relationship among the voltages and the currents, realistic nature of the phase currents and the true power/energy including the content of distortion. Sometimes, suitable error codes' are displayed in order to facilitate the corrective action, whenever such installation checks reveal inappropriate outcome.

In order to ensure proper operation while in service; some static energy met&s perform periodic checks of vital hardware components like memory, RTC, etc, and display/record diagnostic outcome whether satisfactory or not. It runs through a series of electronic analysis

verifying various functions of the meter and provides an important tool for monitoring of meter performance.

This feature can be alternatively provided on meter reading instrument.

6.6 **Pre-payment Metering**

Unlike in revenue (credit) metering where a consumer is supplied electricity on credit, a pre-payment metering system requires a consumer to pay for the electricity units intended to be consumed in advance, thereby obviating the need of meter reading and billing if not at all eliminating the same.

A pre-payment system essentially consists of a 'electricity dispenser' installed at each consumer site. The electricity dispenser is generally a static metering unit with a built in isolating device. Electricity units are 'sold' at 'Vending station', which issues 'tokens' against advance payment. Tokens are information that can be securely transferred to the electricity dispenser to 'credit' them with electricity units. Tokens could be sent by magnetic cards, smart cards, as encrypted numbers (to be entered on an electricity dispenser keypad) or by direct remote communication. The vending station may be linked to central computer system called 'System Master Station' that carries out the database management.

Once credited with vend tokens, the consumer can use electricity units until his credit falls to a pre-defined minimum value, when he is disconnected by the isolating device. The consumer has to maintain this minimum credit (or debit) level by adding further valid tokens in order to get uninterrupted supply.

Alternatively, currency units and not electricity units are credited by the vend tokens in a pre-payment meter, wherein different tariff structures can be programmed by means of codes as part of the vend tokens. Depending on the manner of electricity dispensation, that is quantum, period, time of use, etc, the residual currency units get updated and are shown on the display of the meter.

6.7 **Remote Meter Reading**

Under consideration.

ANNEX A
(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS

IS No.	*Title*
1885 (Part 11) : 1966	Electrotechnical vocabulary : Part 11 Electrical measurements
2705 (Part 2) : 1992	Current transformers : Part 2 Mesauring current transformers
3156 (Part 2) : 1992	Voltage transformers : Part 2 Measuring voltage transformers
8530 : 1977	Specification for maximum demand indicators, Class 1
13010 : 1990	a.c. watt-hour meters, class 0.5, 1 and 2
13779 : 1999	a.c. Static watt-hour meters, class 1 and 2
14415: 1997	Volt-ampere hour meters for restricted power factorrange
14798 : 1999	a.c. Static transformer operated watt-hour and VAr-hour meters, class 0.2S, 0.5S

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 1986* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form-without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Director (Publications), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Handbook' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ET 13 (5023).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 'Bahadur Shah Zafar Marg, New Delhi 110002
Telephones : 323 01 31, 323 94 02, 323 33 75

Telegrams: Manaksanstha (Common to all offices)

Regional Offices:	Telephone
Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg NEW DELHI 110002	323 76 17 323 38 41
Eastern : 1/14 C. I. T. Scheme VII M; V. I. P. Road, Maniktola CALCUTTA 700054	337 84 99, 337 85 61 337 86 26, 337 86 62
Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160022	60 38 43 60 20 25
Southern : C. I. T. Campus, IV Cross Road, CHBNNAI 600113	235 02 16, 235 04 42 235 15 19, 235 23 15
Western : Manakalaya, E9 MIDC, Marol, Andheri (East) MUMBAI 400093	832 92 95, 832 78 58 832 78 91, 832 78 92

Branches : AHMADABAD. BANGALORE BHOPAL. BHUBANESHWAR. COIMBATORE FARIDABAD. GHAZIABAD. GUWAHATI. HYDERABAD. JAIPUR. KANPUR. LUCKNOW. NAGPUR. PATNA. PUNE. THIRUVANANTHAPURAM.

Printed at New India Printing Press, Khurja, India